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a preselected mode of vibration in accordance with a driving signal applied thereto, at least one of the piezoelectric elements having a thickness which differs from that of at least one of the other piezoelectric elements in accordance with the preselected mode of vibration; a moving member movably disposed on the piezoelectric actuator to undergo movement in response to expansion/contraction movement of the piezoelectric elements; an output mechanism connected to be driven by the moving member; and a power transmitting mechanism for transmitting movement from the moving member to the output mechanism.

ADDITIONAL FEES:

No additional fees are believed required; however, should it be determined that a fee is due, authorization is hereby given to charge any such fee to our Deposit Account No. 01-0268.

REMARKS

In the last Office Action, the Examiner withdrew claims 5-20 from further consideration as being directed to a non-elected invention. Claims 1-4 were rejected under 35 U.S.C. §102(b) as being clearly anticipated by Japanese Patent

No. 09-289342 ("Japan '342"). Additional art was cited of interest.

In accordance with the present response, the specification has been suitably revised to correct minor informalities. The title of the invention has been changed to "PIEZOELECTRIC ACTUATOR, ULTRASONIC MOTOR EQUIPPED WITH PIEZOELECTRIC ACTUATOR, AND ELECTRONIC APPARATUS EQUIPPED WITH PIEZOELECTRIC ACTUATOR" to more clearly reflect the invention to which the claims are directed. Original independent claim 1 has been amended to further patentably distinguish from the prior art of record. Claims 1-4 have also been amended in formal respects to improve the wording thereof. Non-elected claims 5-20 have been canceled without prejudice or admission and subject applicants' right to file a continuing application to pursue the subject matter of the non-elected claims. New claims 21-28 have been added to provide a fuller scope of coverage. A new, more descriptive abstract has been substituted for the abstract of record.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached pages i-iv are captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE."

Applicants respectfully request reconsideration of their application in light of the following discussion.

The present invention is directed to a piezoelectric actuator and to an ultrasonic motor and an electronic apparatus equipped with the piezoelectric actuator.

As described on pages 1-4 of the specification, conventional piezoelectric actuators, such as shown in Figs. 13A-13C, have a low energy converting efficiency and are unable to output a large vibration output.

The present invention overcomes the drawbacks of the conventional art. Fig. 1 shows an embodiment of a piezoelectric actuator 1 according to the present invention embodied in the claims. The piezoelectric actuator 1 has a first group of stacked piezoelectric elements 11-13 for undergoing contraction movement to vibrationally drive the piezoelectric elements 11-13 in a preselected mode of vibration in accordance with a voltage applied thereto. At least one of the piezoelectric elements 11-13 has a thickness which is greater than that of at least one of the other piezoelectric elements 11-13 in accordance with the preselected mode of vibration. A second group of stacked piezoelectric elements 14-16 is stacked with the first group of piezoelectric elements 11-13 and undergoes expansion movement to vibrationally drive the piezoelectric elements 14-16 in the preselected mode of vibration in accordance with a voltage applied thereto. At least one of the piezoelectric

elements 14-16 has a thickness which is greater than that of at least one of the other piezoelectric elements 14-16 in accordance with the preselected mode of vibration.

In another aspect, the present invention is directed to an ultrasonic motor. As shown in Fig. 7A, for example, an ultrasonic motor 7 comprises a piezoelectric actuator such as described above according to the present invention (note first group of stacked piezoelectric elements 71-73 and second group of stacked piezoelectric elements 74-76) and vibrators 7, 8 connected to the piezoelectric actuator to undergo vibration in response to vibration of the first and second groups of stacked piezoelectric elements.

In yet another aspect, the present invention is directed to an electronic apparatus. As shown in Fig. 12, for example, an electronic apparatus 9 comprises a piezoelectric actuator 91 as described above according to the present invention, a movable element 92 movably disposed on the piezoelectric actuator 91 to undergo movement in response to expansion/contraction movement of the piezoelectric elements, an output mechanism 95 connected to be driven by the movable element 92, and a transmission mechanism 94 for transmitting movement from the movable element 92 to the output mechanism 95.

By the foregoing construction, a piezoelectric actuator, an ultrasonic motor and an electronic apparatus which are compact, which have a high energy converting efficiency, which can output a large vibration output and which are simple to manufacture are obtained.

Applicants respectfully submit that the prior art of record does not disclose or suggest the subject matter recited in amended claims 1-4 and newly added claims 21-28.

Claims 1-4 were rejected under 35 U.S.C. §102(b) as being clearly anticipated by Japan '342. Applicants respectfully traverse this rejection and submit that amended claims 1-4 recite subject matter which is not identically disclosed or described in Japan '342 nor obvious in view of Japan '342.

Amended independent claim 1 is directed to a piezoelectric actuator and requires a plurality of stacked piezoelectric elements for undergoing expansion/contraction movement to vibrationally drive the piezoelectric elements in a preselected mode of vibration in accordance with a driving signal applied thereto, at least one of the piezoelectric elements having a thickness which differs from that of at least one of the other piezoelectric elements in accordance with the preselected mode of vibration.

As stated by the Court of Appeals for the Federal Circuit in the case of In re Spada, 15 USPQ2d 1655, 1657 (CAFC, 1990):

Rejection for anticipation or lack of novelty requires, as the first step in the inquiry, that all the elements of the claimed invention be described in a single reference. Richardson v. Suzuki Motor Co., 9 USPQ2d 1913, 1920 (Fed. Cir.), cert. denied.

Similarly, as earlier stated by the Court of Customs and Patent Appeals in the case of In re Marshall, 198 USPQ 344, 346 (CCPA, 1978):

Rejections under 35 USC 102 are proper only when the claimed subject matter is identically disclosed or described in the prior art. In re Arkely, 59 CCPA 804, 807, 455 F.2d 586, 587, 172 USPQ 524, 526 (1972). In other words, to constitute an anticipation, all material elements recited in a claim must be found in one unit of prior art. Soundscriber Corp. v. United States, 360 F.2d 954, 960, 148 USPQ 298, 301 (Ct.cl. 1966).

Japan '342 does not describe or disclose the subject matter of amended independent claim 1 and thus does not anticipate this claim.

Japan '342 discloses a multilayer piezoelectric actuator 10 having piezoelectric plates 11a-11f and electrodes 12 disposed between the piezoelectric plates and outer

surfaces thereof (Fig. 1). The piezoelectric plates 11a-11f are selected so that those plates near the center of the multilayer structure are thicker and those near to the outside are thinner.

However, Japan '342 does not disclose or describe a piezoelectric actuator having a plurality of stacked piezoelectric elements for undergoing expansion/contraction movement to vibrationally drive the piezoelectric elements in a preselected mode of vibration in accordance with a driving signal applied thereto, at least one of the piezoelectric elements having a thickness which differs from that of at least one of the other piezoelectric elements in accordance with the preselected mode of vibration. Since this feature in amended independent claim 1 is not found in Japan '342, the reference does not anticipate the claimed invention. See, In re Lange, 209 USPQ 288, 293 (CCPA 1981). Furthermore, Japan '342 does not suggest the claimed subject matter and, therefore, would not have motivated one skilled in the art to modify the piezoelectric actuator in Japan '342 to arrive at the claimed invention.

Claims 2-4 depend on and contain all of the limitations of amended independent claim 1 and, therefore, distinguish from the reference at least in the same manner as claim 1.

In view of the foregoing, applicants respectfully request that the rejection of claims 1-4 under 35 U.S.C. §102(b) as being clearly anticipated by Japan '342 be withdrawn.

Applicants respectfully submit that the prior art of record also does not disclose or suggest the subject matter recited in newly added claims 21-28.

New claims 21-23 depend on and contain all of the limitations of amended independent claim 1 and, therefore, distinguish from the reference at least in the same manner as claim 1.

Moreover, there are separate grounds for patentability of dependent claims 21-23.

Claim 21 includes the additional limitation that the piezoelectric actuator further comprises driving means for inputting a driving signal to the piezoelectric elements to generate a driving force for expanding/contracting the piezoelectric elements in a stacking direction of the piezoelectric elements. This structural combination and corresponding function is not disclosed or described in Japan '342.

Claim 22 is directed to an ultrasonic motor comprising the piezoelectric actuator according to amended independent claim 1 and a vibrator connected to the

piezoelectric actuator to undergo vibration in response to vibration of the piezoelectric elements. Claim 23 depends on claim 22 and includes the additional limitation that the vibrator has a thickness equal to that of the piezoelectric actuator. No corresponding structural features are disclosed or described by Japan '342.

New independent claim 24 is directed to an ultrasonic motor and requires a piezoelectric actuator comprised of a plurality of stacked piezoelectric elements for undergoing expansion/contraction movement to vibrationally drive the piezoelectric elements in a preselected mode of vibration in accordance with a driving signal applied thereto. Claim 24 further requires that at least one of the piezoelectric elements has a thickness which differs from that of at least one of the other piezoelectric elements in accordance with the preselected mode of vibration. No corresponding structure is disclosed or suggested by the prior art of record as set forth above for amended independent claim 1.

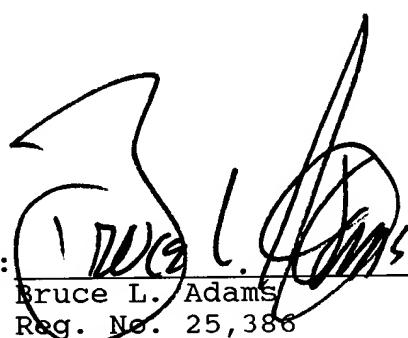
For the reasons noted above, applicants respectfully submit that the prior art of record also does not disclose or suggest the subject matter recited in new claims 25-28.

In view of the foregoing amendments and discussion, applicants respectfully submit that the application is now in

condition for allowance. Accordingly, favorable reconsideration and allowance of the claims are most respectfully requested.

Respectfully submitted,

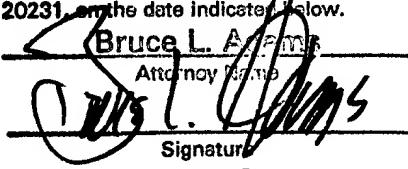
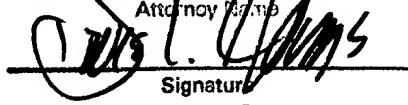
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MAILING CERTIFICATE

I hereby certify that this correspondence is being deposited with the United States Postal Service as first-class mail in an envelope addressed to: Commissioner of Patents & Trademarks, Washington, D.C. 20231 on the date indicated below.

  
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